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# D&D Technology Demonstrations and Deployments at the INEEL

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# D.O.E and the Deactivation & Decommissioning Focus Area



- Many Surplus Contaminated Facilities Nationwide
- 7,000 Facilities to Deactivate
- 700 Facilities to Decommission





# Improved Technologies Needed



- Baseline technologies are not ideal
- Better technologies exist
- Not in widespread use in D&D Operations





# Two Step Solution



- Demonstrate
  - Large Scale Demonstration and Deployment Project (LSDDP)
- Deploy
  - Accelerated Site Technology Deployment Project (ASTD)



# Goals of Demonstration and Deployment

- Complete D&D Operations with reduced
  - Cost
  - Schedule
  - Waste Volume & Secondary Waste
  - Radiation Exposure
- And Increased
  - Safety

- Demonstration
  - Identify INEEL needs
  - Select new technologies
  - Demonstrate
    - Full scale
    - D&D Operations/Field Conditions
    - Side by side with baseline technology
  - Document performance
  - Independent Benefit Analysis
  - Publish Findings



# LSDDP Managed by an Integrated Contractor Team



- Experts from cross section of companies, Universities, and contractors in D&D related fields
- Team has authority for project decisions, including what technologies will be demonstrated





# LSDDP Integrated Contractor Team



- Parsons International
- BNFL
- LMITCO
- Florida International University
- Idaho State University
- TLD Services
- US Army Corps of Engineers
- DOE Federal Energy Technology Center
- Technology Vendors





# LSDDP Technology Selection Criteria



- New/Improved
- Mature Technology
- Not Previously Demonstrated
- Meets INEEL D&D need
- Large Potential for Benefit





# LSDDP Independent Benefit Analysis



- U.S. Army Corps of Engineers
  - Cost
  - Safety
  - Secondary Waste Reduction
  - Reduced Exposure to Radiation
  - Schedule





# LSDDP Publishes Findings



- Fact Sheets
- Innovative Technology Summary Reports
- Website **<http://id.inel.gov/lsddp>**
- Conferences and Papers
- Videos and Photographs



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- 108 Technologies reviewed
  - 20 Selected for detailed evaluation
  - 9 Approved for Demonstration
  - 3 Demonstrated

- Deploy best technologies from LSDDP
  - Procure technologies
  - Use in D&D Operations
  - Measure overall benefits
  - Publish Findings



# ASTD Team



- Three National Laboratories
  - Idaho National Engineering and Environmental Laboratory
  - Fernald Environmental Management Project
  - Argonne National Laboratory - East
- D&D Operations at each site





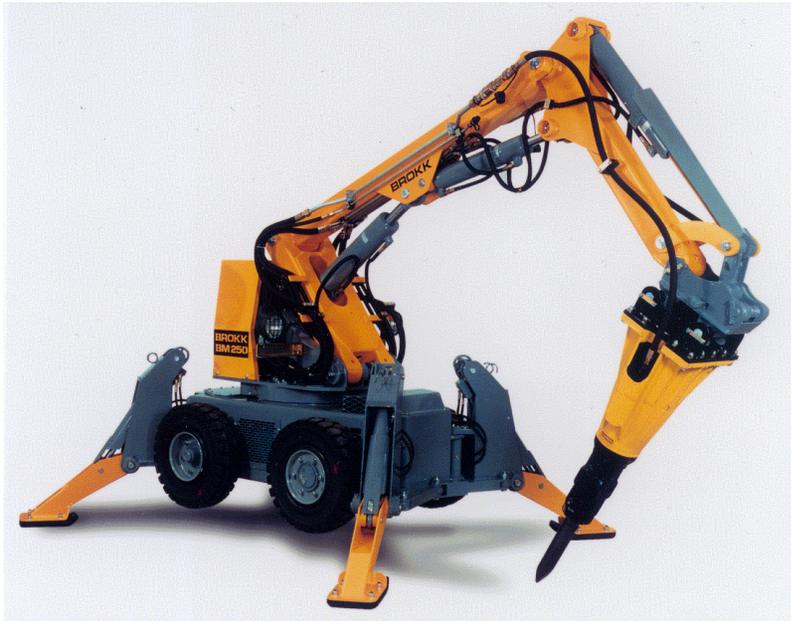
# ASTD Technologies being Deployed



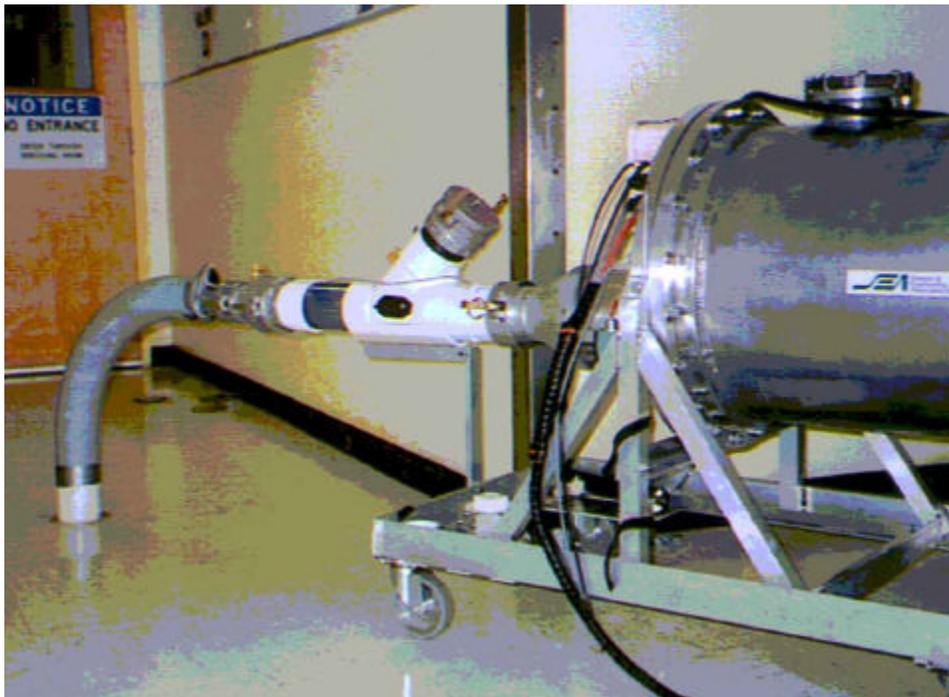
<u>Technology</u>	<u>Site</u>	<u>Supplier</u>
BROKK Demolition Robot Pipe Explorer	INEEL, ANL-E INEEL	BROKK Holmhed  Science and Engineering Associates
GammaCam	INEEL	AIL Systems, Inc.
DDROPS	INEEL	INEEL
Oxy-Gasoline Torch	INEEL, FEMP, ANL-E	Petrogen, Inc.
Personal Ice Cooling System	INEEL, FEMP, ANL-E	Delta Temax, Inc.
Hand Held Shear	FEMP	Lucas Rescue Tools, Inc.
Track-Mounted Shear/Grapple	FEMP	John Deere, Pemberton Mfg., and Tiger Mfg.
Soft Sided Containers	INEEL	Transport Plastics, Inc.



# BROKK 250BM Demolition Robot



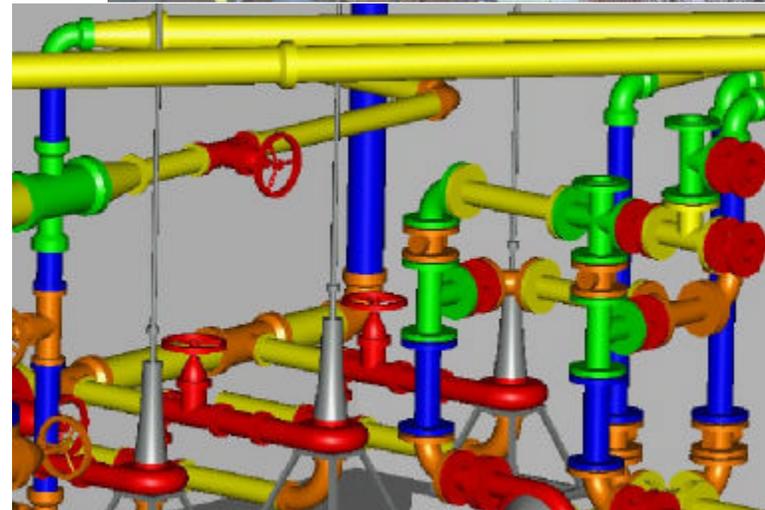
- **Mobile demolition robot**
- **Tethered or radio remote controlled**
- **Multiple end-effectors:**
  - Scabbler
  - Hydraulic shear
  - Hammer
  - Grapple
  - Bucket
- **Reduces radiation exposure**
- **Increases Safety**
- **BROKK Holmhed Systems AB**



- **Characterizes piping contamination in situ**
  - **alpha, beta, gamma, video, position**
- **Membrane prevents contamination of sensor**
- **Pipe runs up to 122m, and 5-45cm diameter**
- **50% of pipe can be blocked**
- **Science and Engineering Associates, Inc.**

# Decontamination, Decommissioning and Remediation Optimal Planning System (DDROPS)

- Solid geometric modeling and optimization technique
- To identify locations for segmenting contaminated materials,
- To determine packaging routines resulting in improved packaging densities,
- To minimize radiation exposure,
- Inventory/manifest of waste contents
- INEEL Patent Pending



# Remote Underwater Characterization System



- **Characterized the ARMF/CFRMF reactors in August 1998**
- **Identified radiation levels higher than previously detectable**
- **Identified objects on the pool floor previously not visible due to restricted access**
- **Inuktun Services Ltd.**
- **Modified by INEEL**
  - **added auto-depth control**
  - **integrated gamma radiation detector**



- **Packaging of Low Level Waste/Debris**
- **260 cubic foot capacity compared to 96 cubic foot**
- **\$380 per container vs. \$750 for metal boxes**
- **Moulds around itself for void volume reduction**
- **DOT IP-1 Approved**
- **Transport Plastics, Inc.**

# Oxy-Gasoline Torch



- Cut carbon steel
  - Less fuel
  - Cuts 65% faster
  - Safer than oxy-acetylene torch
- Benefits
  - Reduce cost
  - Reduce radiation exposure
  - Reduce waste volume
  - Accelerate schedule
  - Increase safety
- Petrogen, Inc.



- Remote radiation survey
- Benefits
  - Reduce cost
  - Reduce radiation exposure
  - Accelerate schedule
- AIL Systems, Inc.

# Personal Ice Cooling System

- Keeps radiation workers cool
- Benefits
  - Reduce cost
    - For 70 - 80° F, saves 39%
    - For > 85° F, saves 66%
    - For > 85° F, payback time = 9 hours
  - Reduce radiation exposure
  - Accelerate schedule
  - Increase productivity
  - Increase safety
- Delta Temax, Inc.



- Self-powered shear
- Benefits
  - Reduce cost
  - Reduce radiation exposure
  - Reduce lead exposure
  - Accelerate schedule
    - Cuts 20% faster
- Lucas Rescue Tools



# Track-Mounted Shear/Crusher



- Demolition tool
- Benefits
  - Improve worker safety
  - Reduce lead exposure
  - Improve productivity by automating process
- John Deere, Pemberton, and Tiger Mfg.

# ASTD Measures Overall Benefits

- Cost
- Radiation Exposure
- Schedule
- Waste Volume
- Overall Safety



# ASTD Publishes Findings



- Fact Sheets
- Website **<http://id.inel.gov/idd>**
- Conferences and Papers
- Videos and Photographs



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- 5 Technologies Procured
  - 4 Technologies Deployed
  - 9 Structures Demolished at FEMP
  - 7 Technologies will be deployed this year at the INEEL
  - 3 Technologies will be deployed this year at ANL-E

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- Need for new technologies in D&D
  - DOE's two step solution
  - Demonstration by LSDDP
  - Deployment by ASTD



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# INEEL D&D Websites



- 
- LSDDP <http://id.inel.gov/lsddp>
  - ASTD <http://id.inel.gov/idd>

